Department of Electrical and Computer Engineering

COURSE OUTLINE

ELEC 584/461 – Dynamics and Control of Switched Mode Power Supplies

Term - SPRING 2015 (201501)

Instructor

Dr. Subhasis Nandi
Phone: 250-721-8679
E-mail: snandi@ece.uvic.ca

Office Hours

Days: TW or by appointment
Time: 11:30 AM -12:30 PM or by appointment
Location: EOW 407

Lectures

A-Section(s): ELEC 461- A01 / CRN 23952;   ELEC 584- A01 / CRN 23953;
Days: TWF
Time: 10:30-11:30 AM
Location: HHB 116

Required Text

Title: Power Electronics
Author: Daniel W.Hart
Publisher: McGraw Hill
Year: 2010

Optional Text

Title:
Author:
Publisher:
Year:

References:

Assessment:

Assignments: 15% for ELEC 584, 30% for ELEC 461
End of term exam: 35% for ELEC 584, 30% for ELEC 461
Project: 50% for ELEC 584, 40% for ELEC 461

Note: Failure to complete project will result in a grade of N being awarded for the course.

Due Dates for Assignments and Exam: TBD

The final grade obtained from the above marking scheme will be based on the following percentage-to-grade point conversion:

Passing Grades	Grade Point Value	Percentage for Instructor Use Only	
A+	9	90 – 100	
A	8	85 – 89	
A-	7	80 – 84	
B+	6	77 – 79	
B	5	73 – 76	
B-	4	70 – 72	
C+	3	65 – 69	
C	2	60 – 64	
D	1	50 – 59	
Failing Grades	**Grade Point Value**	**Percentage for Instructor Use Only**	**Description**
E	0	0 - 49	Fail, *Conditional supplemental exam. (For undergraduate courses only)
F	0	0 – 49	Fail, no supplemental.
N	0	0 – 49	Did not write examination, Lab or otherwise complete course requirements by the end of term or session; no supplemental exam.

Assignment of E grade will be at the discretion of the Course Instructor.

The rules for supplemental examinations are found on page 80 of the current 2014/15 Undergraduate Calendar.

Term in which E Grade Was Obtained	Application Deadline for Supplemental Exam	Supplemental Exam Date
First term of Winter Session (Sept – Dec)	February 28 in the following term	First week of following May
Second term of Winter Session (Jan – Apr)	June 30 in the following term	First week of following September
Summer Session (May – Aug)	October 31 in the following term	First week of following January

Deferred exams will normally be written at the start of the student's next academic term; i.e., approximately 4 months following the deferral of the exam.

Updated Dec. 12, 2014

Course Description

1. Course Objectives

- Analyze problems with linear dc-dc converter.
- Analyze and design non-isolated switched-mode dc-dc converters such as Buck, Boost, Buck-Boost, Cuk, Sepic etc. operating in continuous and discontinuous conduction mode. Numerical examples will illustrate design objectives.
- Analyze and design isolated switched mode dc-dc converters such as Flyback, Forward, Push-pull, half bridge, full bridge, Current Source converters, etc. operating in continuous and discontinuous conduction mode. Numerical examples will illustrate design objectives.
- Develop and analyze dynamic models of switched mode dc-dc converters using state-space averaging technique. Design controllers for closed loop control of converters. The dynamic model development and the controller design will be illustrated using a numerical example. The control scheme will be demonstrated through simulation.
- Develop dynamic inner current and outer voltage loop models for designing multi-loop controllers. A simplified modeling example will be provided.
- Analysis of PWM switch model as an alternative modeling technique for state-space averaging technique.
- Analysis of modulation techniques for converters such as unipolar, bipolar, sine-triangle and space vector modulation. Numerical examples will illustrate these schemes.

2. Learning Outcomes

The students completing this course will have a very solid understanding of converter operation and control which they will not only find useful for practical converter design but also for research work on converters.

3. Syllabus

Introduction to switch mode power supplies. Detailed analysis of non-isolated converters (Buck, Boost, Buck-boost, Cuk, etc) and isolated converters (Flyback, Forward, Push-pull, half bridge, full bridge, Current Source converters, etc). State space averaging technique to model converters. Design of multi-loop controllers (inner current loop and outer voltage loop). Introduction to PWM switch model as an alternative to state space averaging technique. Space phasor based PWM generation.

Note to Students:

Students should have ELEC 330 and ELEC 360 as pre-requisities. Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the ECE Chair by email or the ECE Chair's Secretary eceasst@uvic.ca to set up an appointment.

Accommodation of Religious Observance
See http://web.uvic.ca/calendar2014/GI/GUPo.html

Policy on Inclusivity and Diversity
See http://web.uvic.ca/calendar2014/GI/GUPo.html

Standards of Professional Behaviour

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour at http://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf
which contains important information regarding conduct in courses, labs, and in the general use of facilities.

Updated Dec. 12, 2014

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult

http://web.uvic.ca/calendar2014/FACS/UnIn/UARe/PoAcI.html for the UVic policy on academic integrity.

Important Notices

1. Food and drinks are NOT allowed in the classrooms.

2. Except for health reasons and family emergencies, the Midterm cannot be rescheduled. Also make-up Midterm will be offered only if a student misses both the midterms with a valid reason.

3. Late submission policy. With 50% reduction on the following next day only (including Saturday, Sunday and holidays). After that no credit for submission will be given. Time will be counted at the point of collection which is the assignment drop box located on ELW 2nd floor.

3. Only scientific calculators*** can be used during the midterms and final. Programmable/graphing calculators will not be allowed. *** (similar in functionality to Casio model fx 250HC).

4. Cell phone usage, including scanning and texting, is strictly prohibited during class hours.